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Fact sheet No. 16 – World Climates

Climate – an introduction

The climate of a locality is the synthesis of the day-to-day values of the meteorological elements that affect the locality. Synthesis here implies more than simple averaging. Various methods are used to represent climate, e.g. both average and extreme values, frequency of values within stated ranges, frequency of weather types with associated values of elements. The main climatic elements are precipitation, temperature, humidity, sunshine, wind velocity, and such phenomena as fog, frost, thunder, gale; cloudiness, grass minimum temperature, and soil temperature at various depths may also be included. Climatic data are usually expressed in terms of an individual calendar month or season and are determined over a period (usually about 30 years) long enough to ensure that representative values for the month or season are obtained.

The climate of a location is mainly governed by the factors of:

a) Latitude
b) Position relative to continents and oceans
c) Position relative to large-scale atmospheric circulation patterns
d) Altitude, and
e) Local geographical features

Climate zones

The word climate is derived from a Greek word meaning ‘to incline’ and the original zones of climate were zones in which the inclination of the sun’s rays at noon was the same, that is, zones of latitude. The accumulation of meteorological data has shown that winds and rainfall, as well as temperature, have a zonal arrangement, but that the true climatic zones do not run strictly parallel to lines of latitude. Eight principal zones are distinguished: near the equator a zone of tropical rain climate, then two subtropical zones of steppe and desert climate, then two zones of temperate rain climate, then, in the northern hemisphere only, an incomplete zone of boreal climate with a great annual range of temperature and finally, two polar caps of snow climate. The equatorial zone is divided into the equatorial rain-forest zone, which extends over the Atlantic and Pacific Oceans as the Doldrums, with rain in all seasons, and a belt of savanna climate on either side with a well marked alternation of dry and rainy seasons, the latter occurring in the ‘summer’ months. The subtropical zones include most of the world great deserts – the Sahara and Kalahari in Africa, and the deserts of Arabia, Arizona, South America and Australia; over the oceans they include the trade wind belts and the horse latitudes (subtropical latitudes between 30 and 35 degrees both north and south, characterized by light winds and hot, dry weather). The temperate zones are divided into the Mediterranean climates with mild, rainy winters and hot, dry summers, and the temperate rain belts with rain in all seasons. On the eastern margins of the continents, especially in Asia, the subtropical desert zone and the Mediterranean climate are replaced by areas with a monsoon climate.

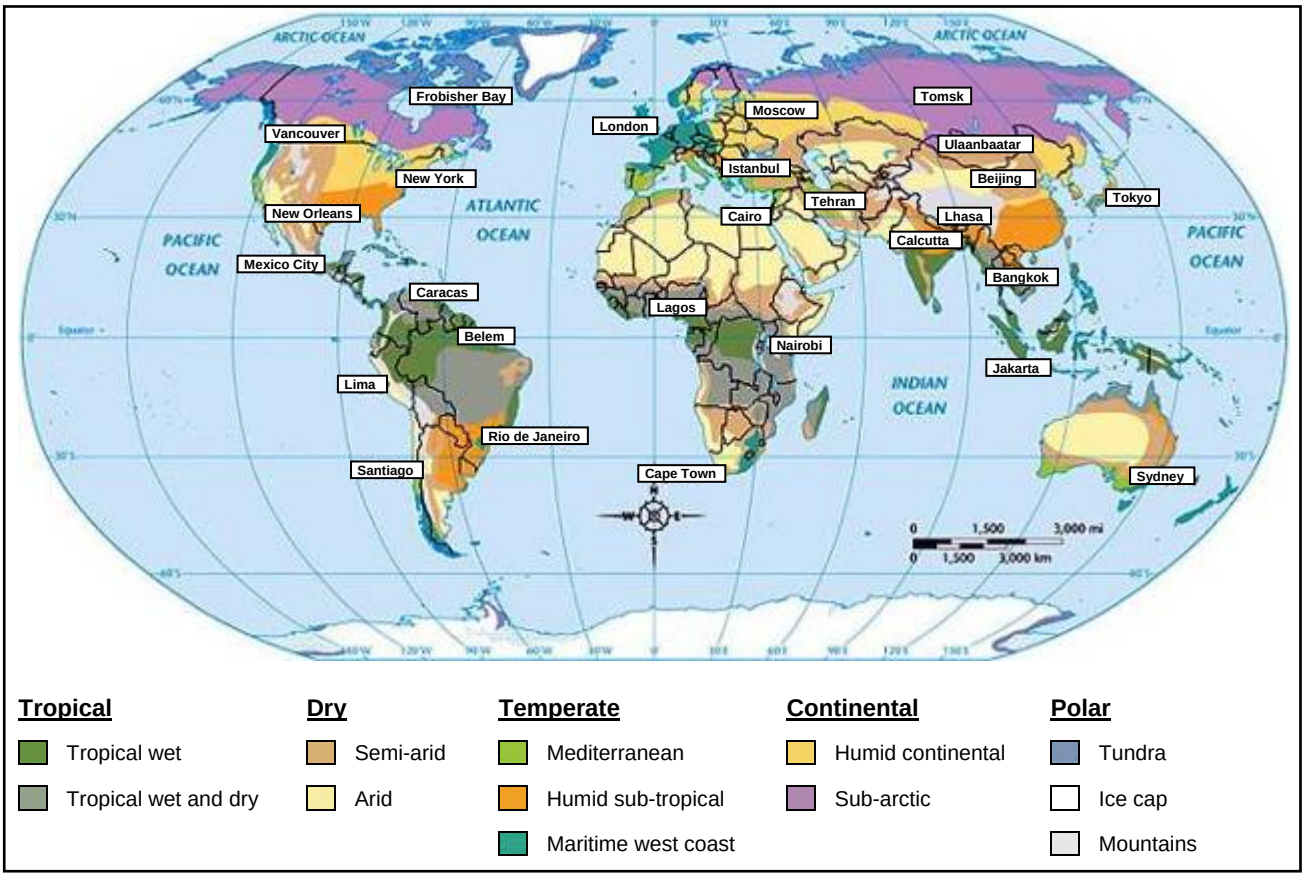


Figure 1. Map of global climate regions

Tropical (tropical wet or tropical wet and dry)

A type of climate which prevails in most equatorial and tropical parts of the earth and is characterized by high temperatures and high humidity throughout the year and frequent rain throughout most of the year. This region can be split into two distinct types, namely:

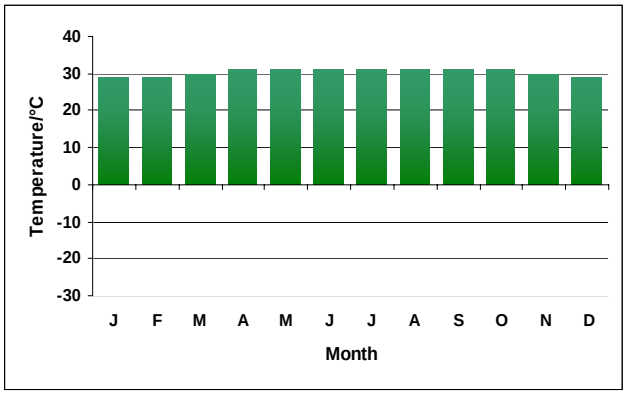
- Tropical wet: here there is no distinct wet or dry season - rainfall is distributed throughout the year. This type of climate is characterised by lush tropical forests like the Amazon rain forest, central parts of Africa and Indonesia.

- Tropical wet and dry: here there is a distinction between a wet and dry season. The wet season is usually influenced by monsoon winds that bring large quantities of moisture to a region. Countries like Bangladesh and the eastern side of India have this type of climate.

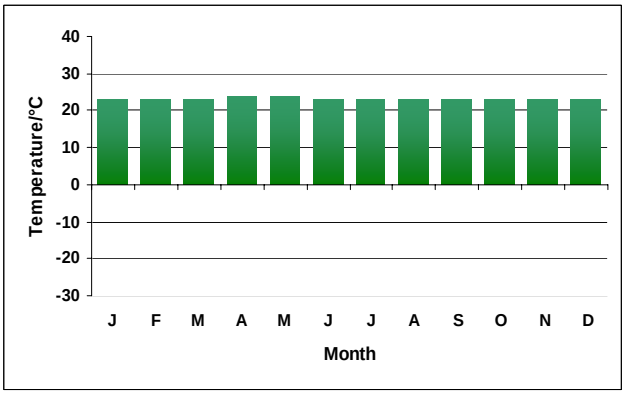
Figure 2. Tropical wet climate: rainforest in Sri Lanka

▪ Tropical wet climate

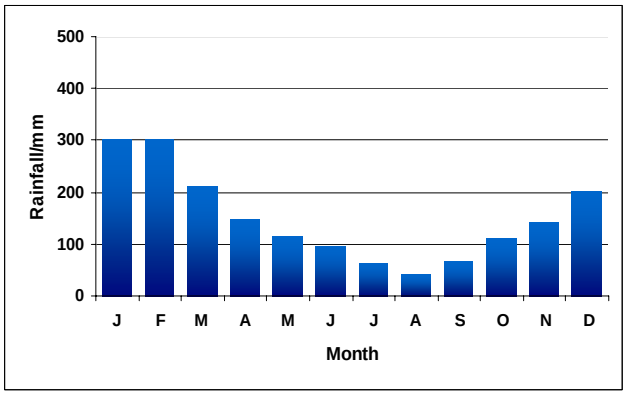
Climate averages the Jakata, Java (06°11'S, 106°50'E)



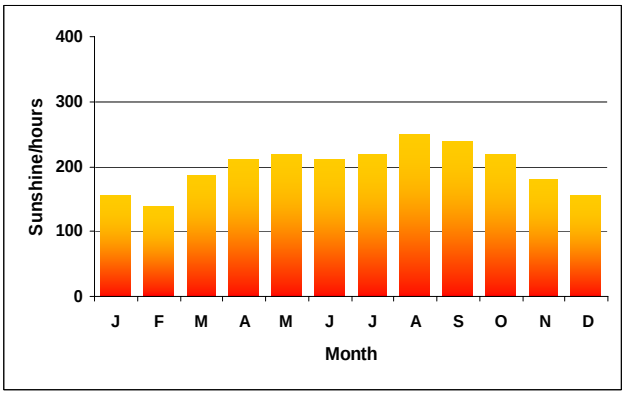
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages

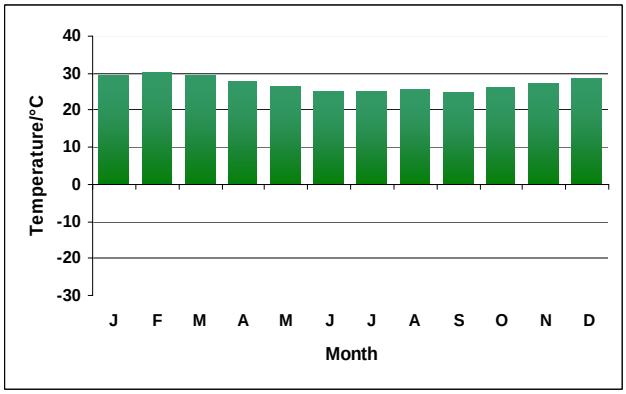


30-year monthly rainfall averages

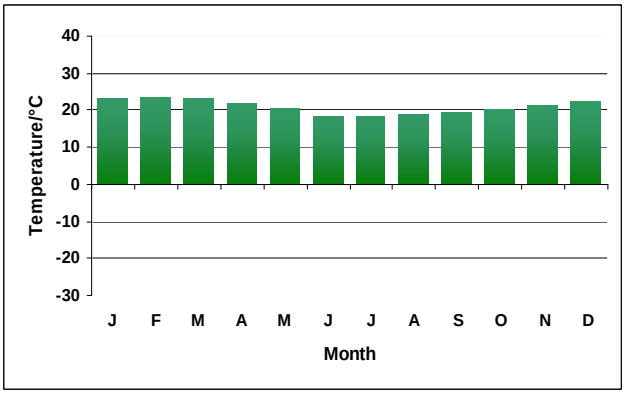


30-year monthly sunshine averages

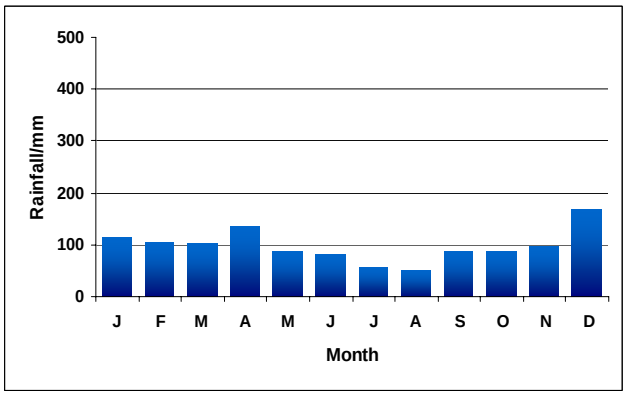
Climate averages for Rio de Janeiro, Brazil (22°55'S, 043°12'W)



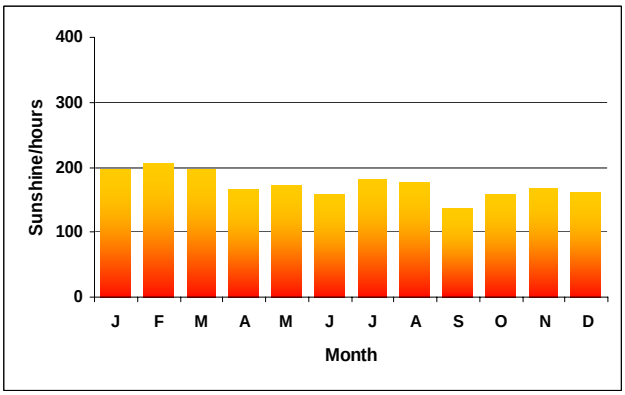
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages

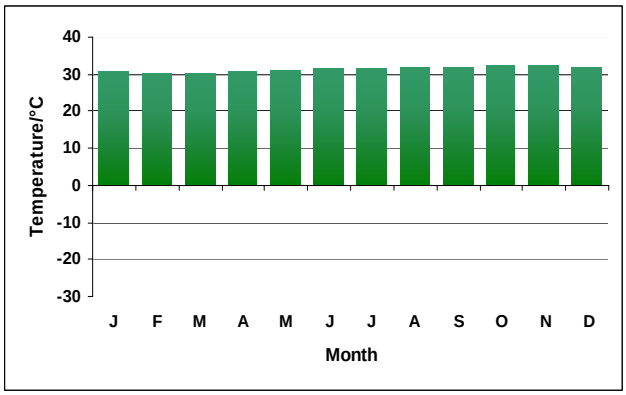


30-year monthly rainfall averages

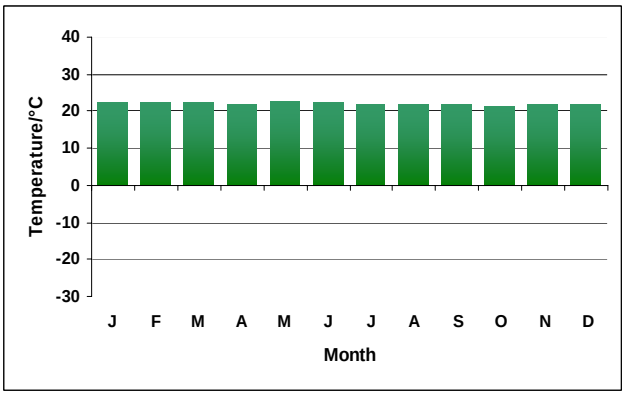


30-year monthly sunshine averages

Climate averages for Belem, Brazil (01°27'S, 048°29'W)



30-year monthly maximum temperature averages



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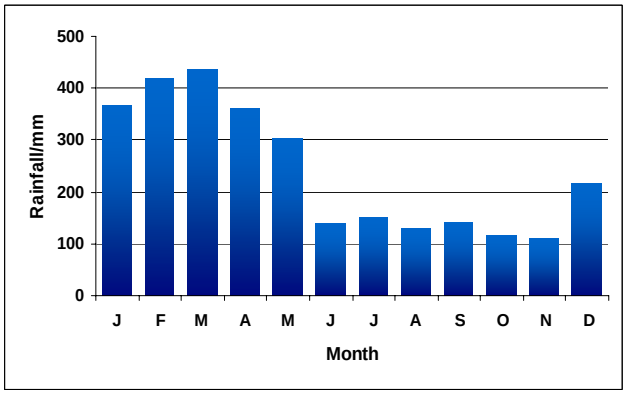
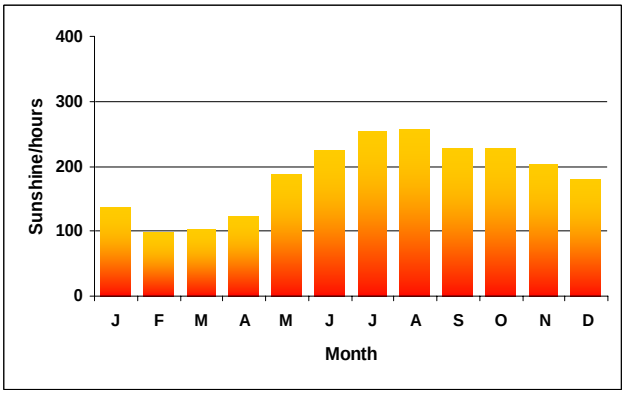


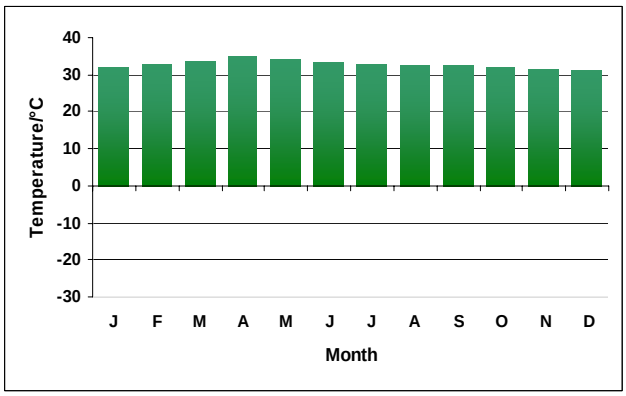
30-year monthly rainfall averages



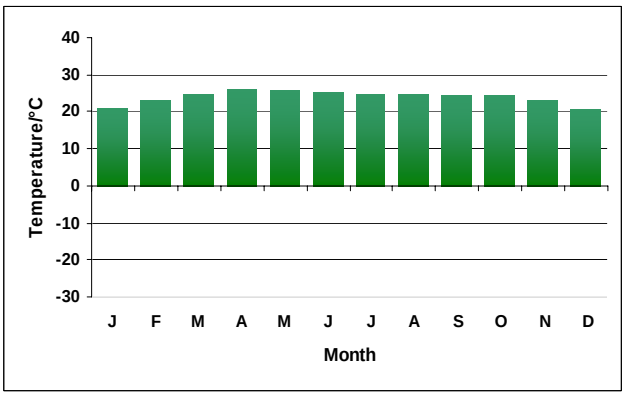
30-year monthly sunshine averages

■ Tropical wet and dry climate

Climate averages for Bangkok, Thailand (13°45'N, 100°28'E)



30-year monthly maximum temperature averages



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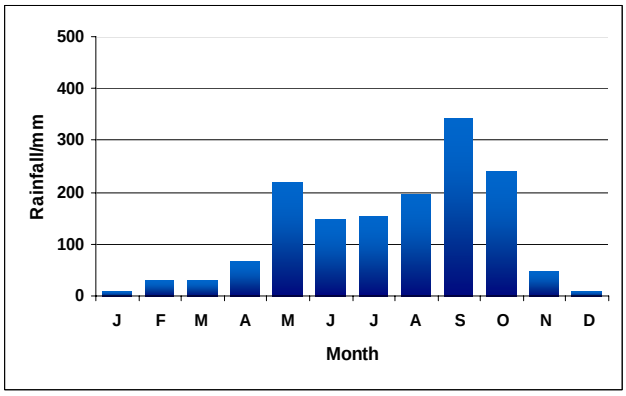

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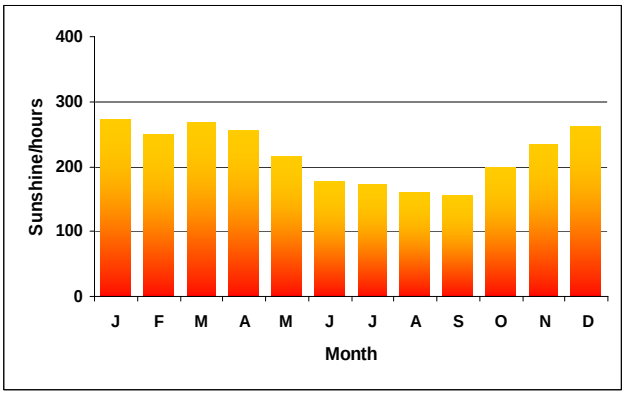

30-year monthly sunshine averages

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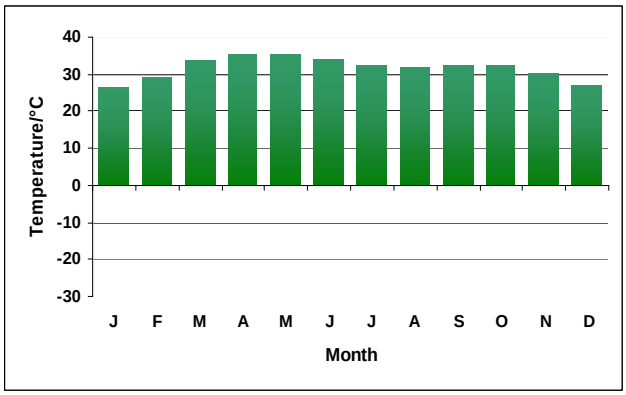
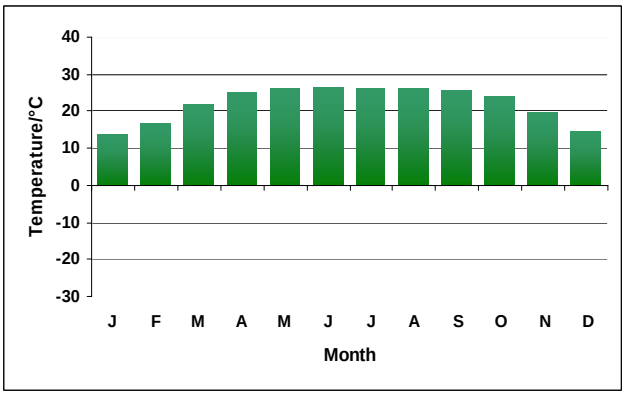
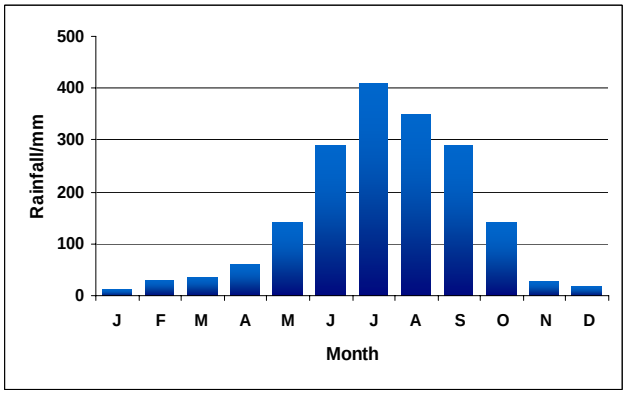
Climate averages for Calcutta, India (22°32'N, 088°20'E)



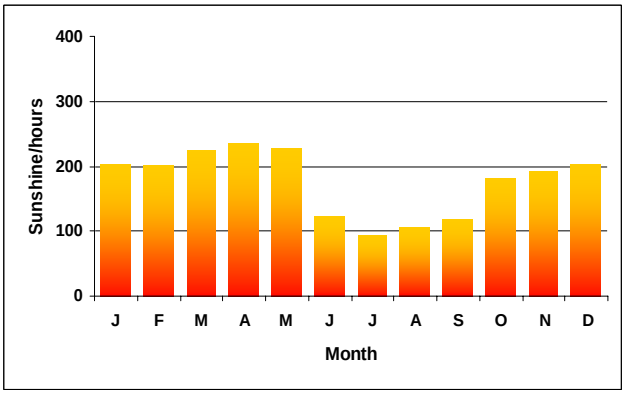
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages

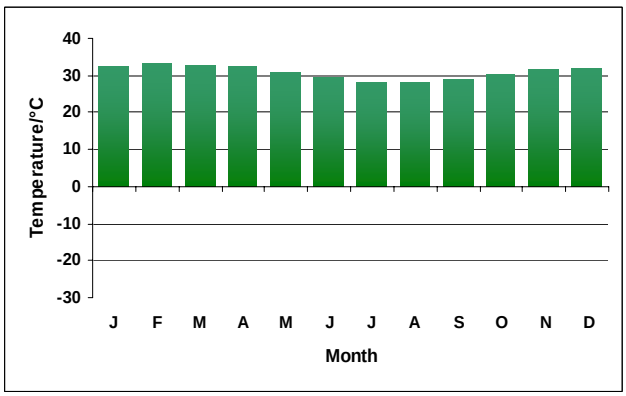


30-year monthly rainfall averages

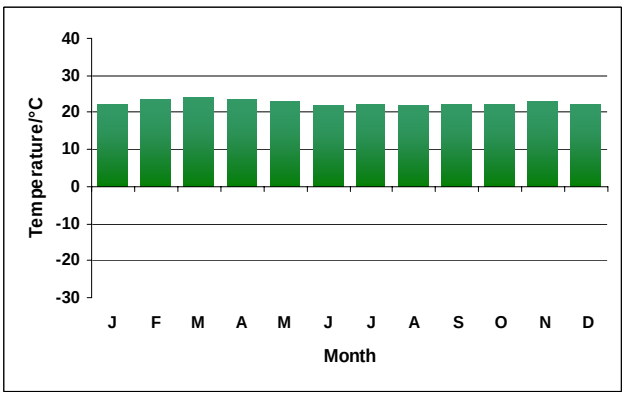


30-year monthly sunshine averages

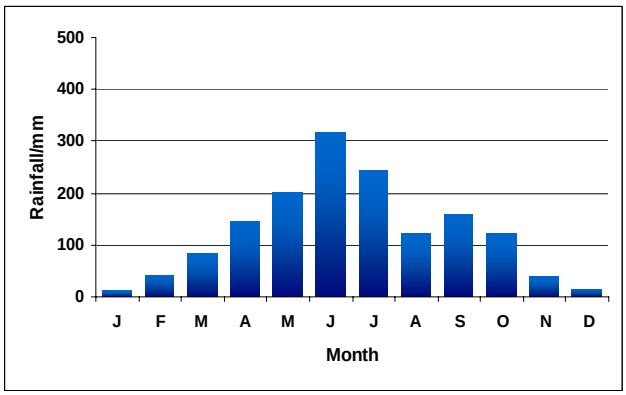
Climate averages for Lagos, Nigeria (06°27'N, 003°24'E)



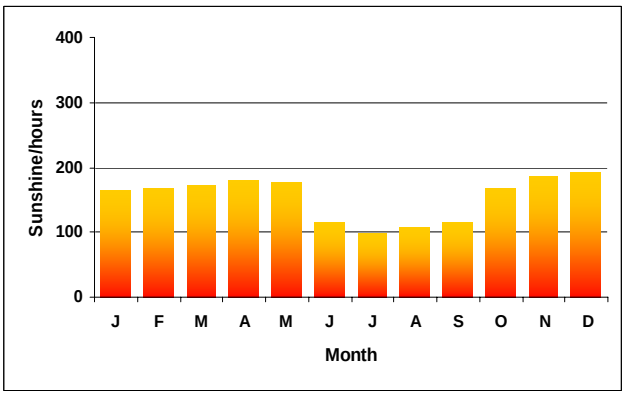
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages



30-year monthly rainfall averages



30-year monthly sunshine averages

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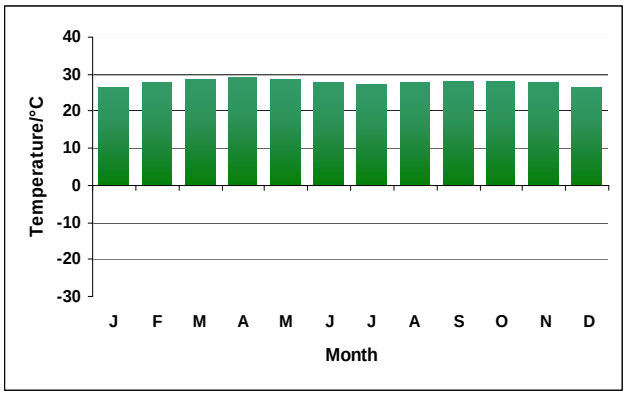
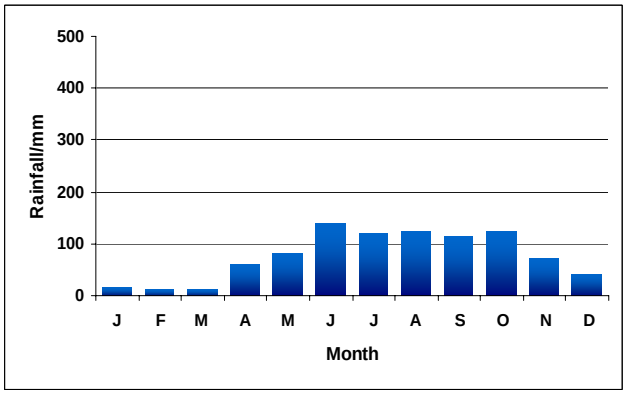
Climate averages for Caracas, Venezuela (10°30'N, 066°56'W)

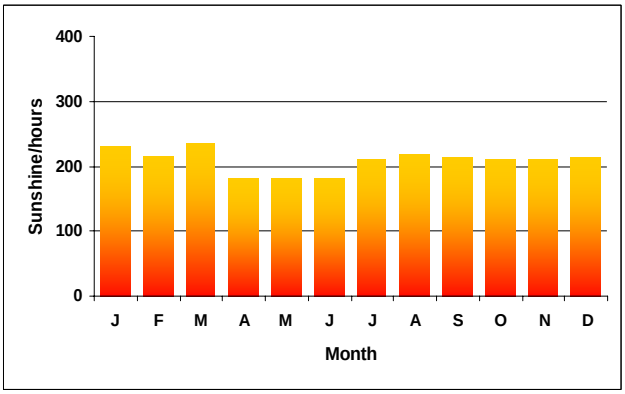


30-year monthly maximum temperature averages

30-year monthly minimum temperature averages



30-year monthly rainfall averages



30-year monthly sunshine averages

Dry (arid and semi-arid)

A type of climate that is predominantly dry. However this region can be split into three distinct temperature ranges, namely hot, warm and cold.

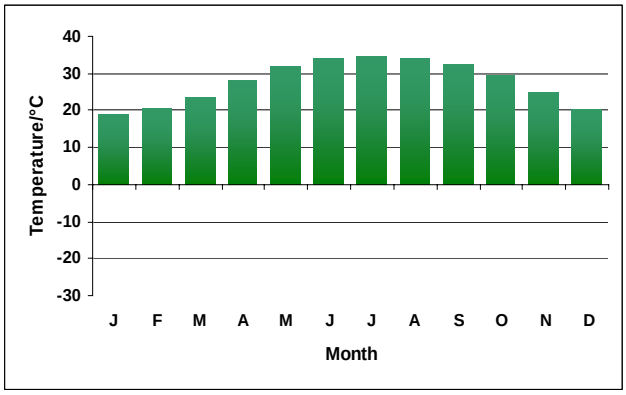
- Hot and dry climates are usually desert regions such as the Sahara and the Arabian. These hot deserts have little rain at any season and no real cold weather although temperature drops sharply at night. Sand or rocks in direct sunlight will easily reach 60 to 70°C (140 to 160°F). But at night temperatures may drop to below freezing.
- Warm and dry climates can be found in places that are semi-desert or dry grassland (tropical steppe) such as the Sahel region of Africa or the drier parts of India. In these regions, although there is a rainy season mainly due to the movement of the intertropical convergence zone (ITCZ)*, the rains can fail several years in succession, causing severe drought.
- Cold and dry climates can be found in the central parts of Asia, such as the Gobi desert. These cold deserts occur in higher latitudes in the interior of large continents and have a climate that is very hot in summer, but bitterly cold in winter.

*The Intertropical Convergence Zone (ITCZ) is a relatively narrow, low-latitude zone in which air masses originating in the two hemispheres converge. Variation in the location of the intertropical convergence zone drastically affects rainfall in many equatorial nations, resulting in the wet and dry seasons of the tropics rather than the cold and warm seasons of higher latitudes. Longer term changes in the intertropical convergence zone can result in severe droughts or flooding in nearby areas.

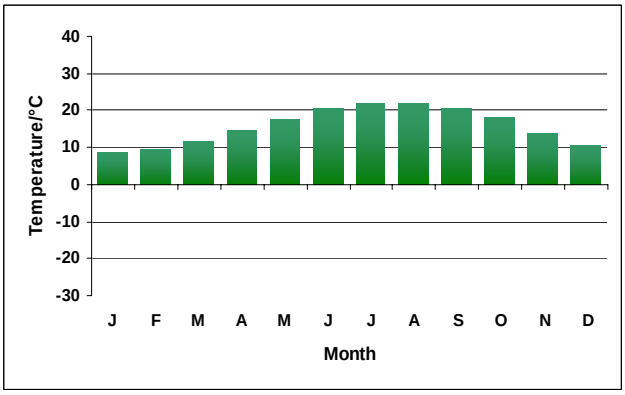
Figure 3. Warm and dry climate: grassland in the Rift Valley in Africa

- **Hot and dry climate**

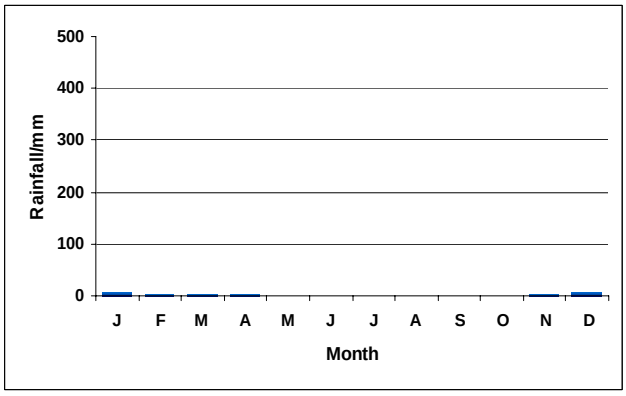
Climate averages for Cairo, Egypt (29°52'N, 031°20'E)



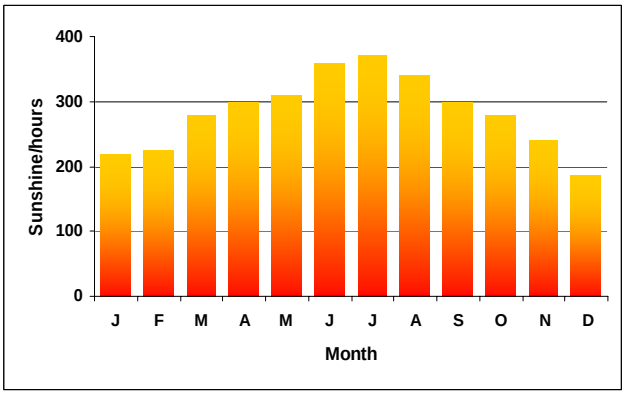
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages

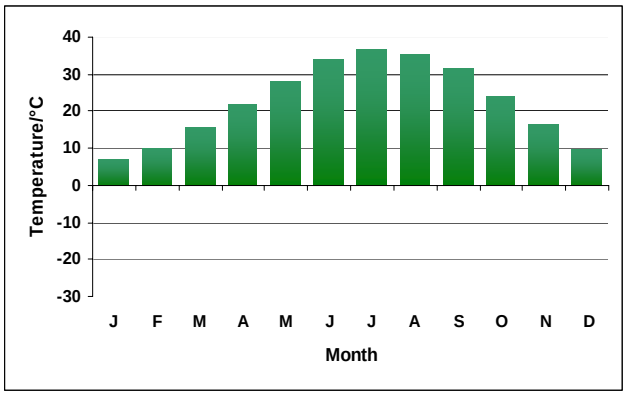


30-year monthly rainfall averages

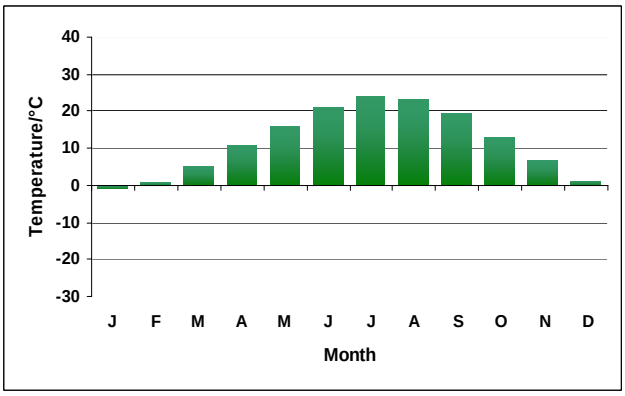


30-year monthly sunshine averages

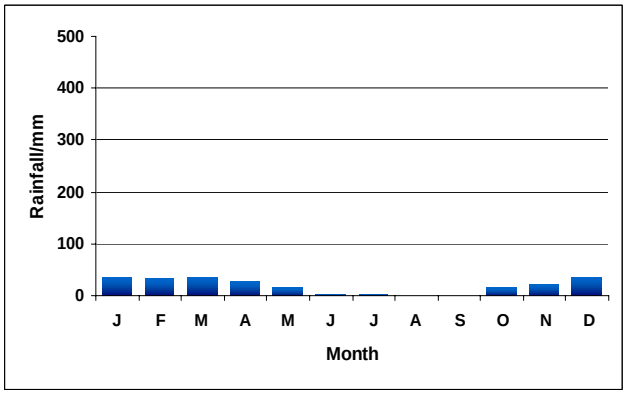
Climate averages for Tehran, Iran (35°41'N, 051°25'E)



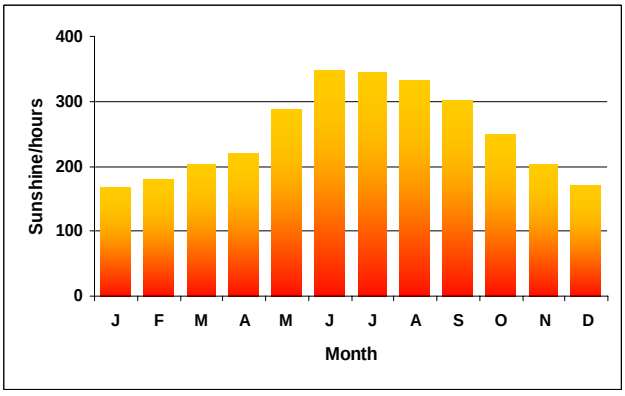
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages



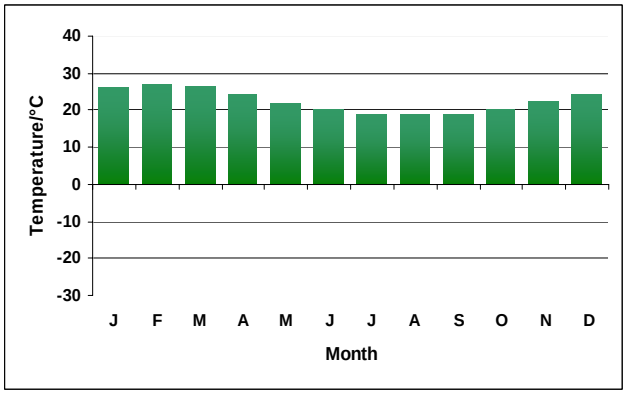
30-year monthly rainfall averages



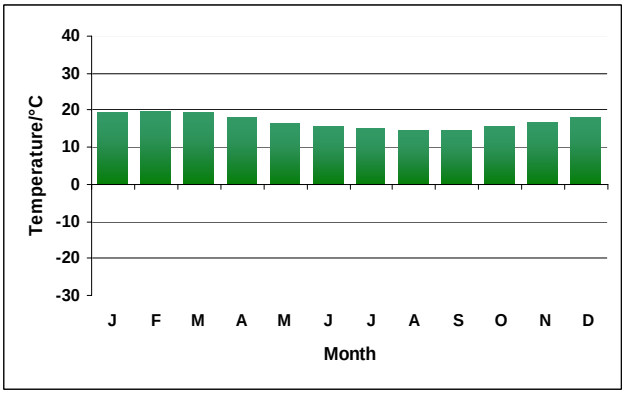
30-year monthly sunshine averages

- **Warm and dry climate**

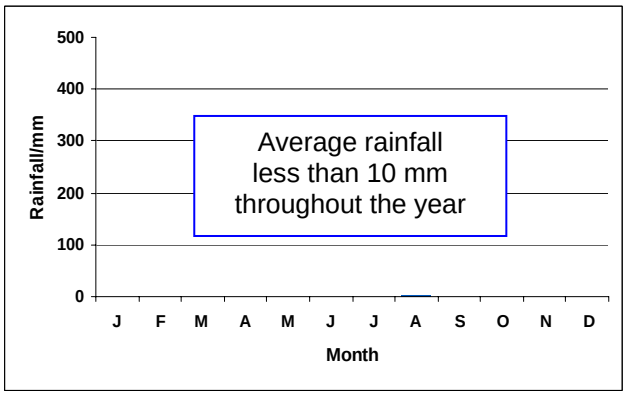
Climate averages for Lima, Peru (12°05'S, 077°03'W)



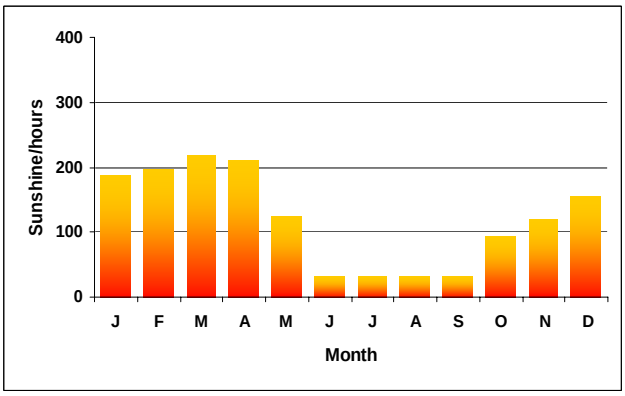
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages



30-year monthly rainfall averages



30-year monthly sunshine averages

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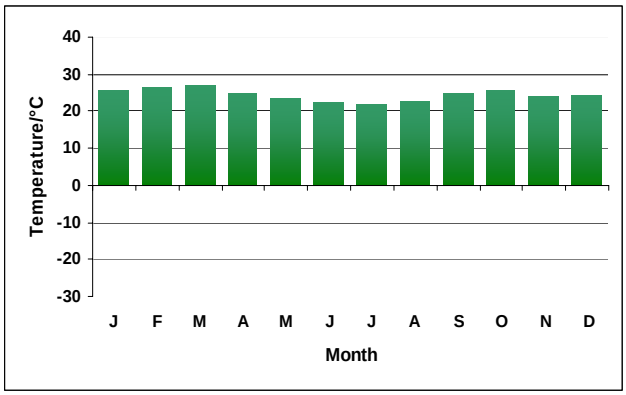
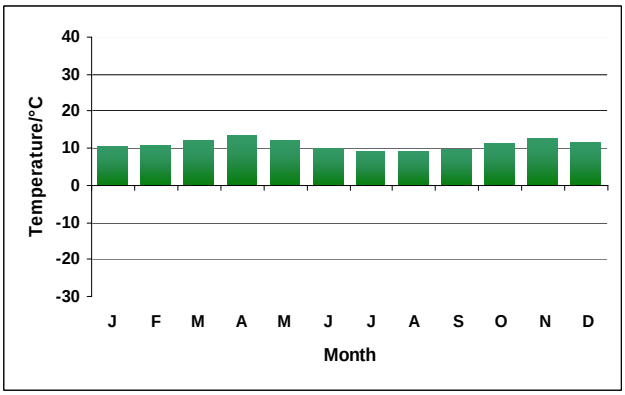
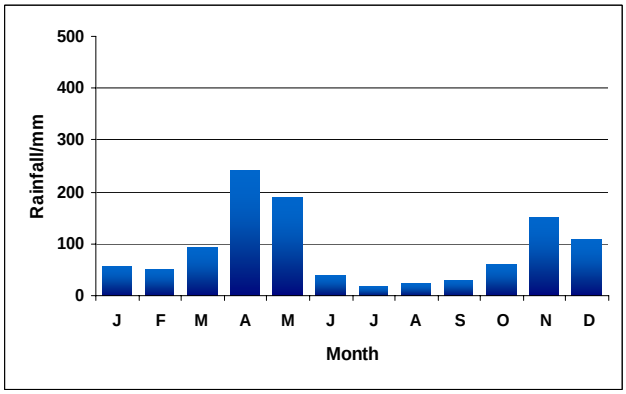
Climate averages for Nairobi, Kenya (01°16'S, 036°48'E)



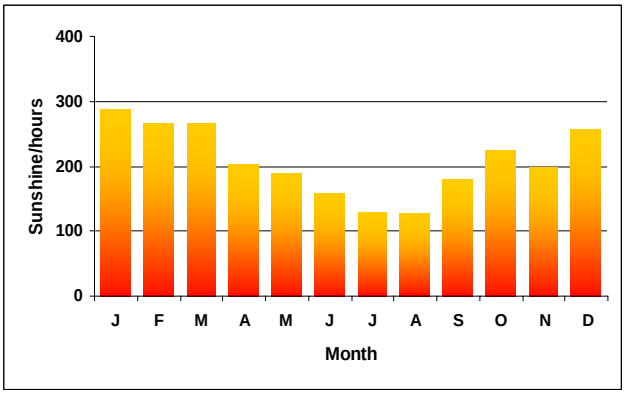
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages

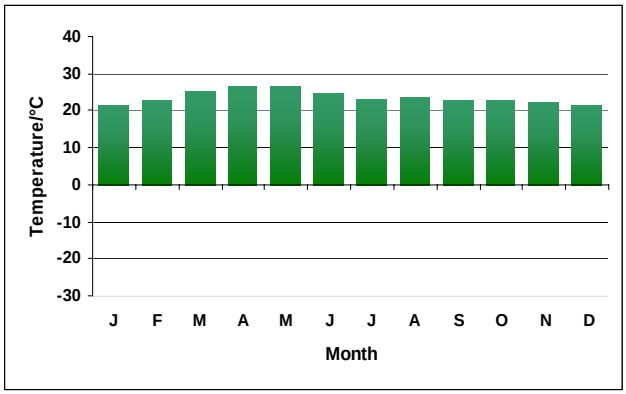


30-year monthly rainfall averages

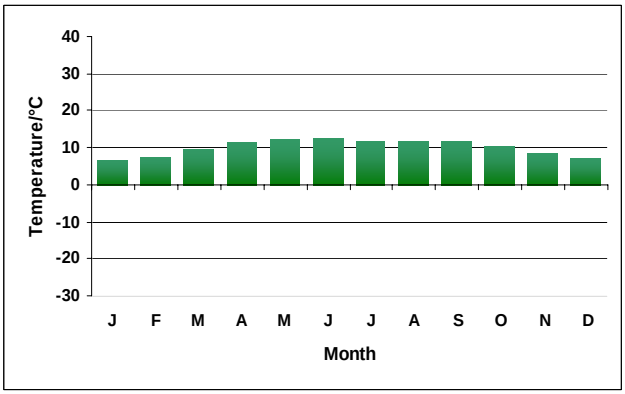


30-year monthly sunshine averages

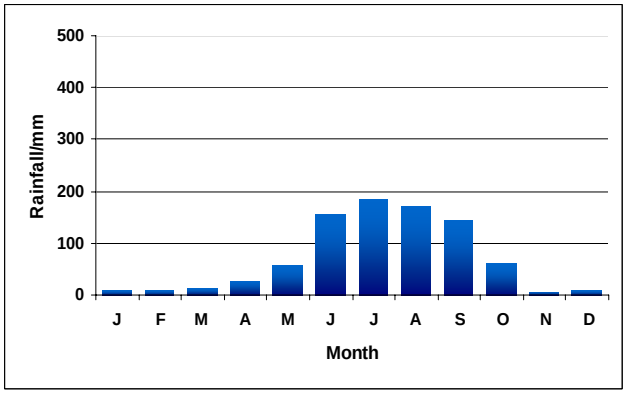
Climate averages for Mexico City, Mexico (19°24'N, 099°12'W)



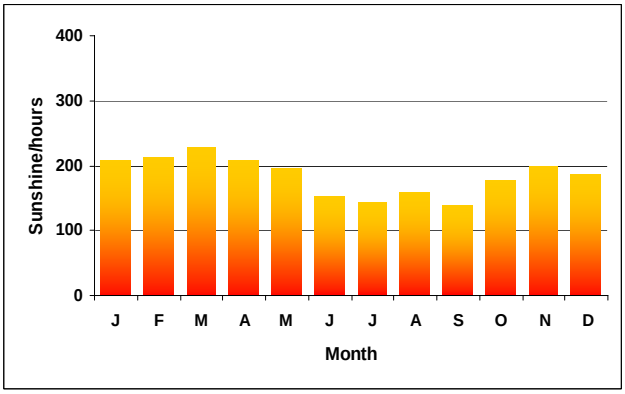
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages



30-year monthly rainfall averages



30-year monthly sunshine averages

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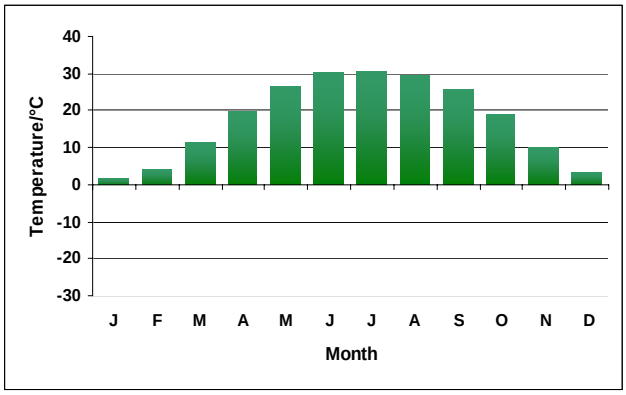
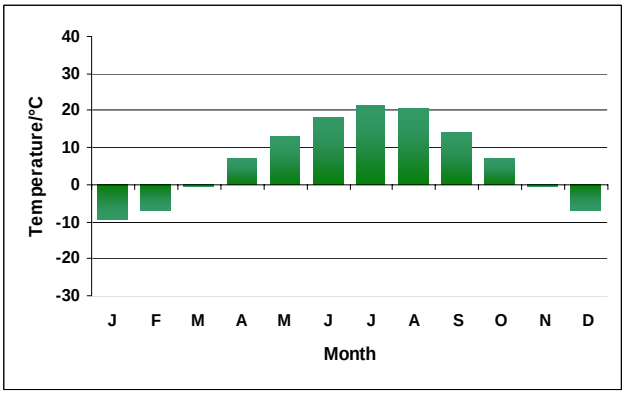
▪ Cold and dry climate

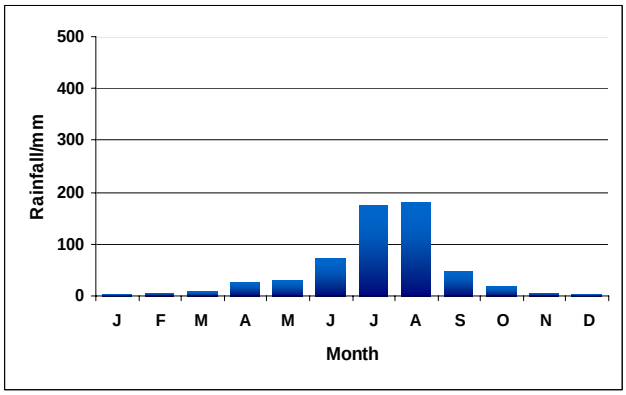
Climate averages for Beijing, China (39°57'N, 116°19'E)



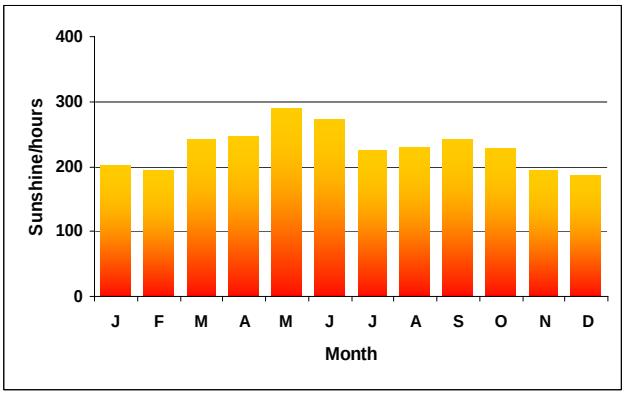
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages

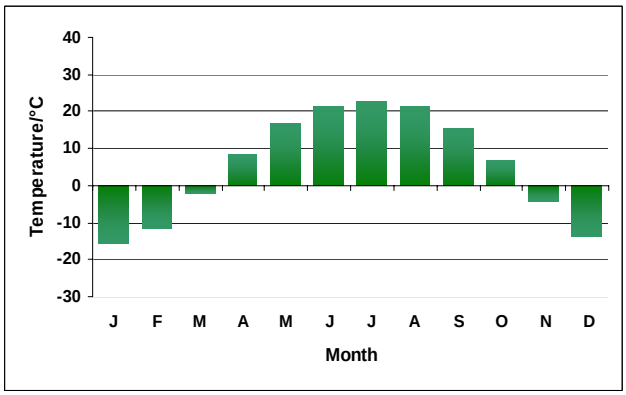


30-year monthly rainfall averages

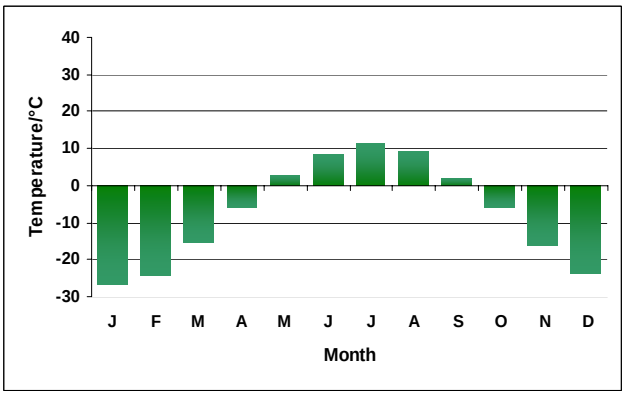


30-year monthly sunshine averages

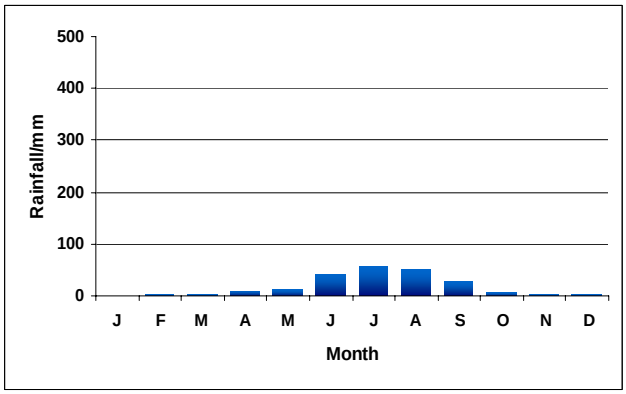
Climate averages for Ulaanbaatar, Mongolia (47°55'N 106°50'E)



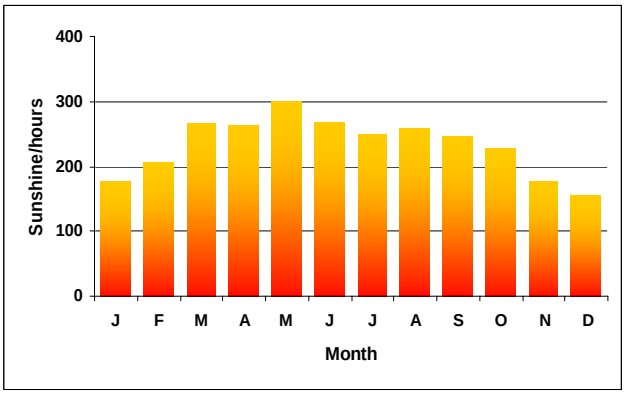
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages



30-year monthly rainfall averages



30-year monthly sunshine averages

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Temperate (Mediterranean, humid sub-tropical and maritime west coast)

Temperate climate zones lie between the tropics and the polar circles. The changes in these regions between summer and winter are generally subtle, warm or cool, rather than extreme, burning hot or freezing cold. However, a temperate climate can have very unpredictable weather. One day it may be sunny, the next it may be raining, and after that it may be cloudy. These erratic weather patterns occur in summer as well as winter.

Temperate climate zones can be split into two distinct types depending on temperature, these are warm temperate which include both Mediterranean and Humid sub-tropical climate types and cold temperate which includes the Marine West Coast type.

Figure 4. Marine west coast climate: Dyfi Forest, mid-Wales.

Warm temperate – here too, the weather can be split into two distinct types, warm and wet or warm and dry.

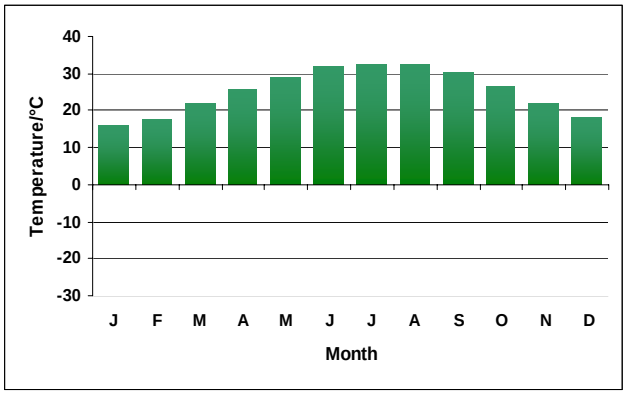
- Warm and wet (humid sub-tropical) areas are places that have rain all year round but summer is the wettest period. Temperatures tend to be warm or hot all year. Eastern China and the southeastern states of the USA, such as Florida, are good examples.
- Warm and dry (Mediterranean) areas are places where the winters tend to be warm and wet but the summers are dry with little or no rainfall. Places around the Mediterranean are good examples of this.

Cold temperate – here too, the weather can be split into two types, cool and wet or cold and dry. Both of these can be classed as maritime west coast.

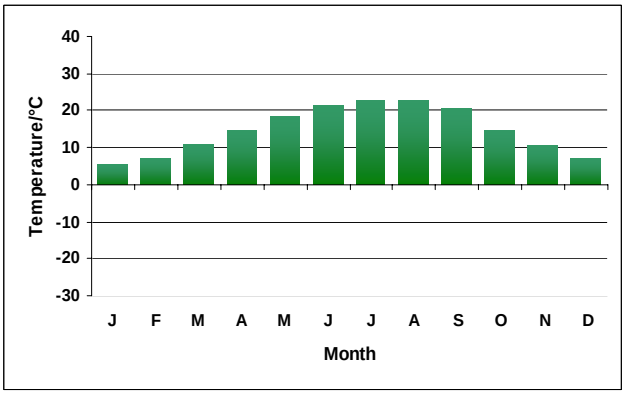
- Cool and wet climates are places where there is rain in all months with no great extremes of temperature throughout the year. The climate of the British Isles is of this type.
- Cold and dry climates are places where the weather is dominated by warm summers and cold winters. Regions such as central Europe are of this type.

- **Warm temperate - (humid sub-tropical)**

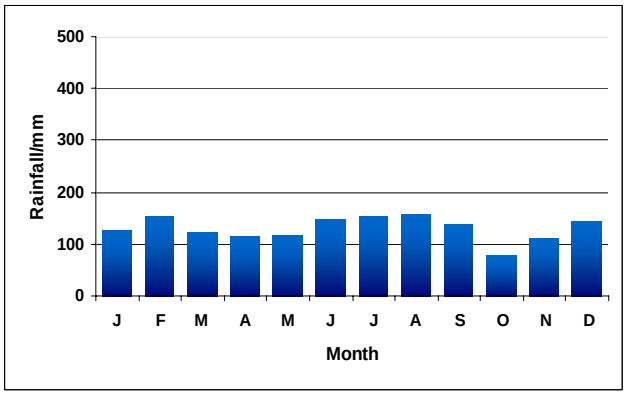
Climate averages for New Orleans, USA (29°57'N, 090°04'W)



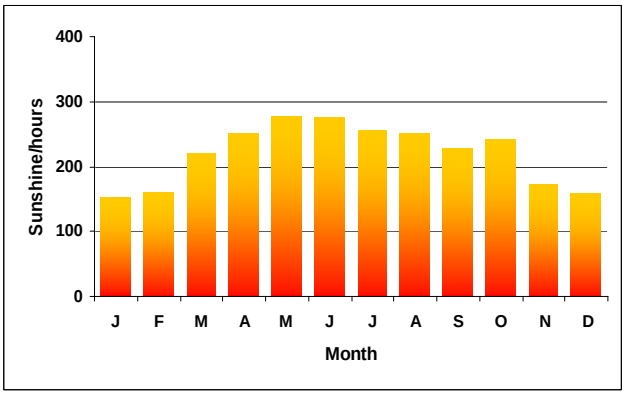
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages

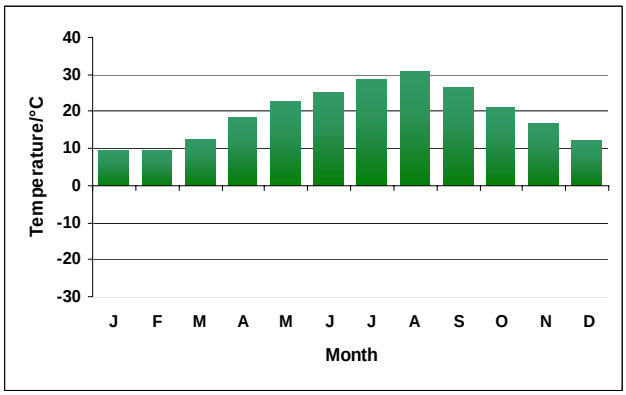


30-year monthly rainfall averages

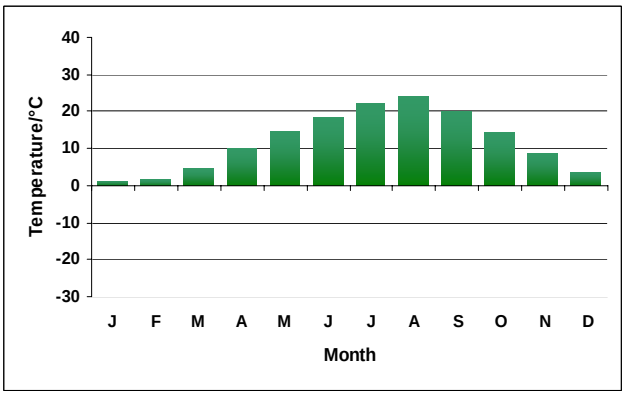


30-year monthly sunshine averages

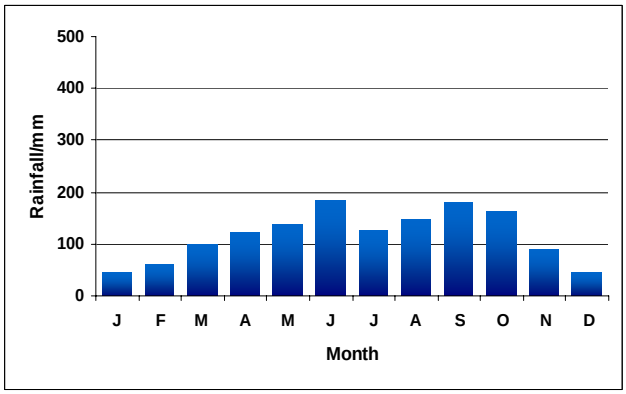
Climate averages for Tokyo, Japan (35°41'N, 139°46'E)



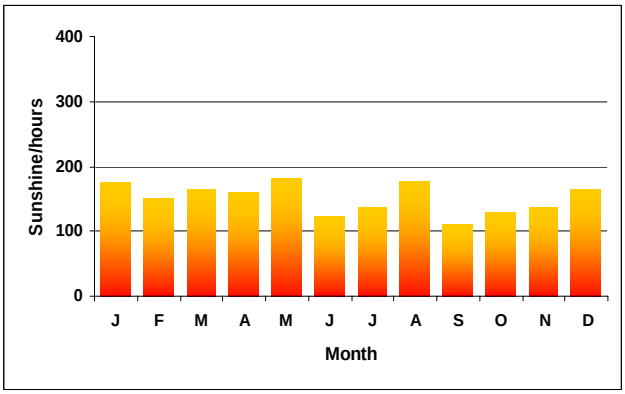
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages

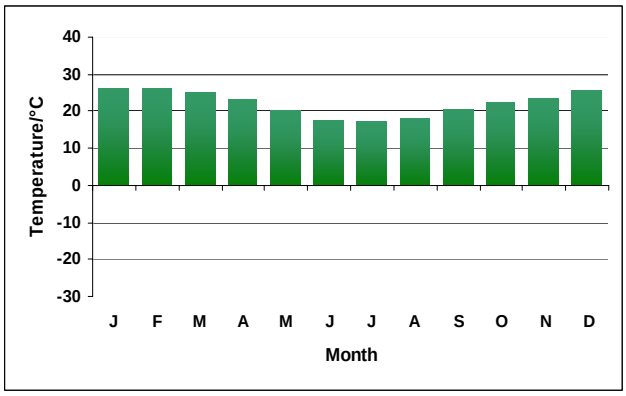


30-year monthly rainfall averages

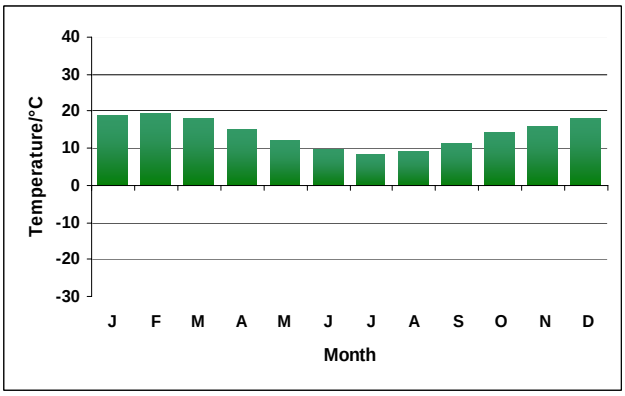


30-year monthly sunshine averages

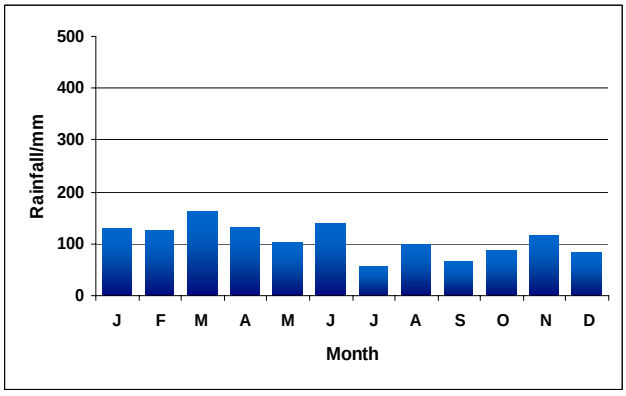
Climate averages for Sydney, Australia (33°52'S, 151°12'E)



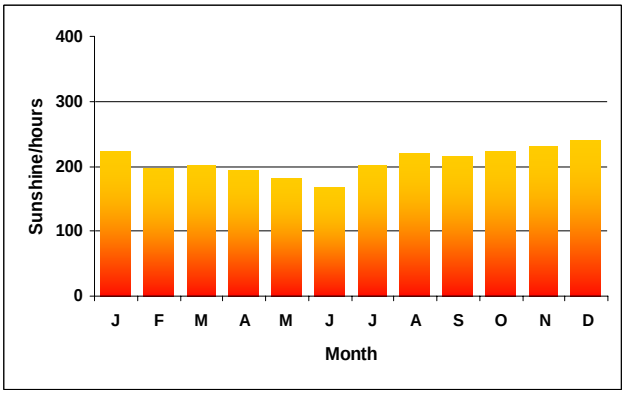
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages



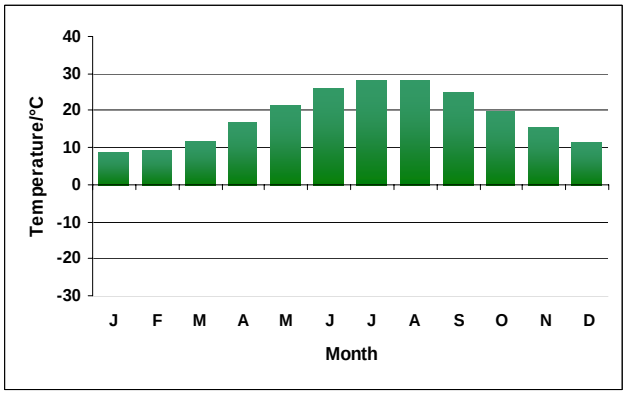
30-year monthly rainfall averages



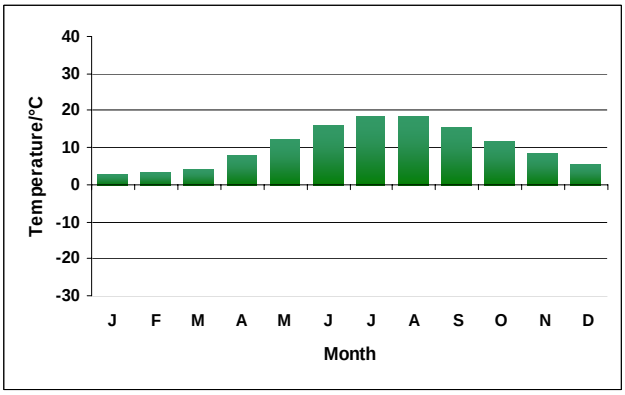
30-year monthly sunshine averages

- **Warm temperate - (Mediterranean)**

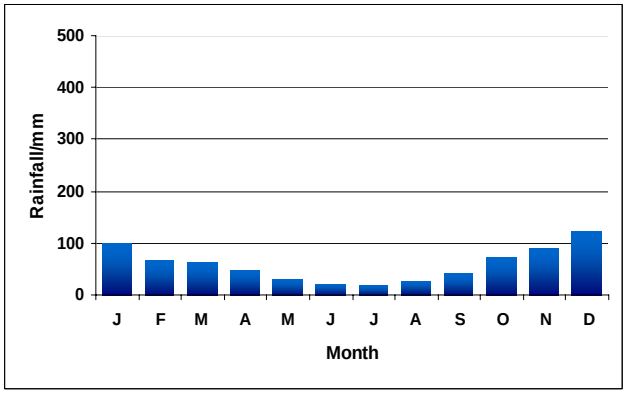
Climate averages for Istanbul, Turkey (41°06'N, 029°03'E)



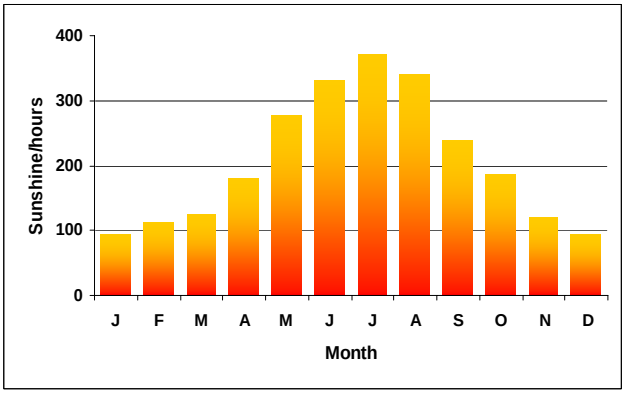
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages

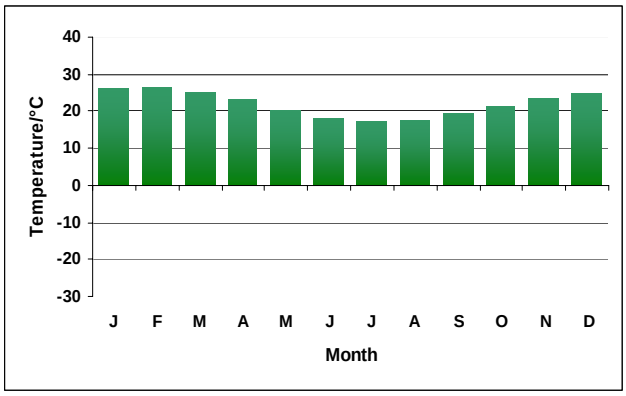


30-year monthly rainfall averages

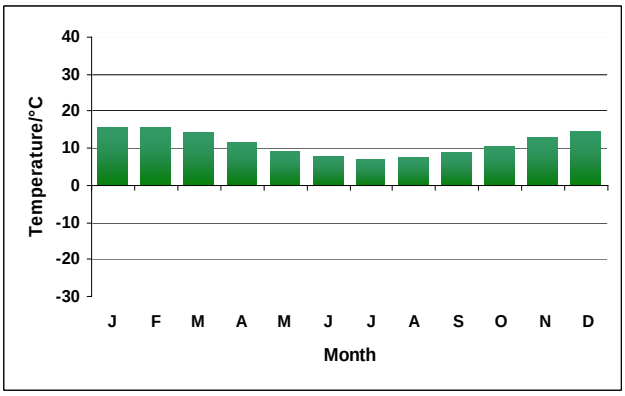


30-year monthly sunshine averages

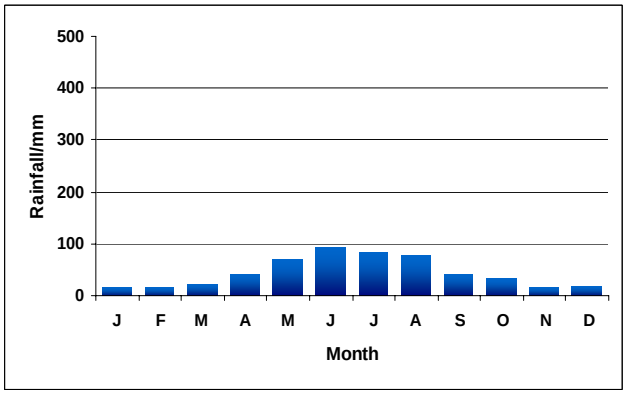
Climate averages for Cape Town, South Africa (33°54'S, 018°32'E)



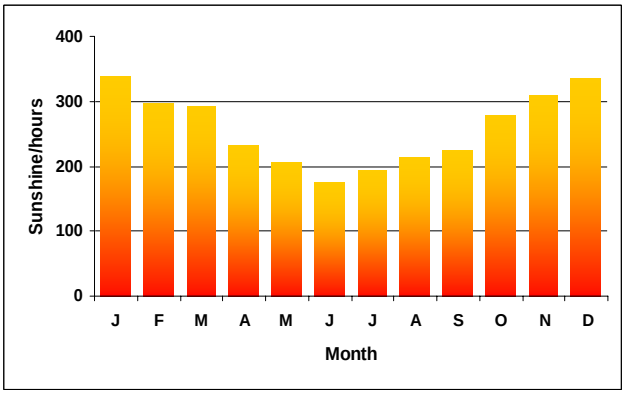
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages

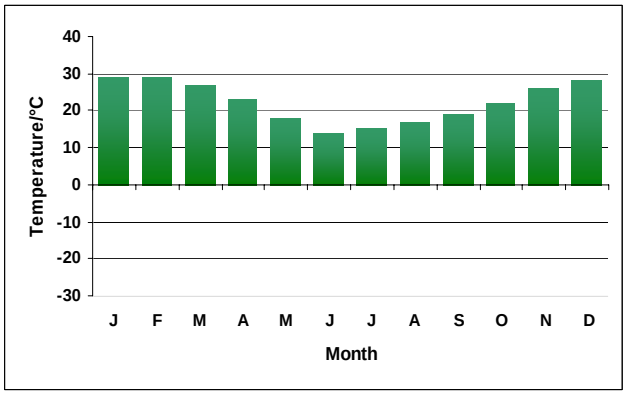


30-year monthly rainfall averages

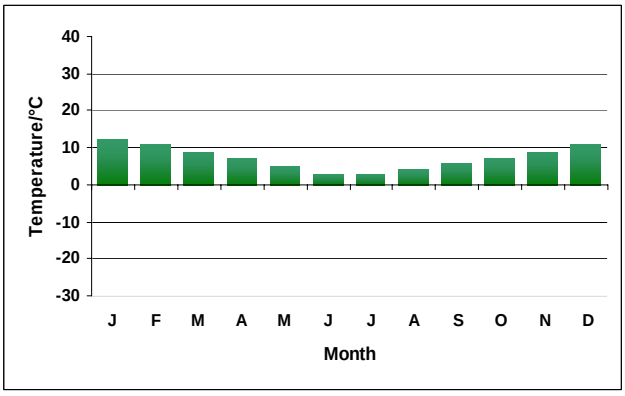


30-year monthly sunshine averages

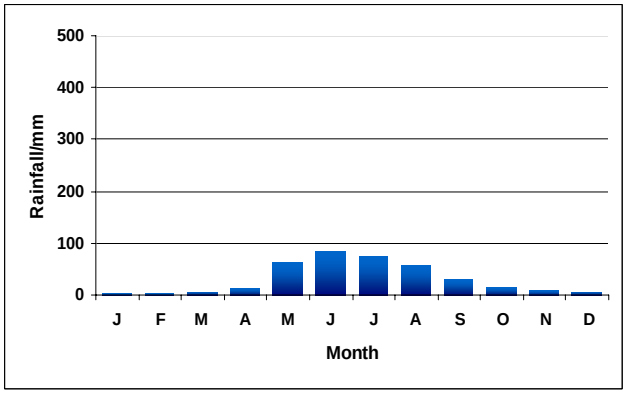
Climate averages for Santiago, Chile (33°27'S, 070°42'W)



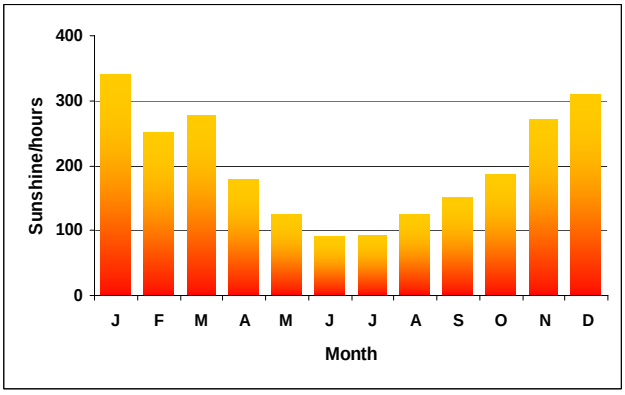
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages



30-year monthly rainfall averages



30-year monthly sunshine averages

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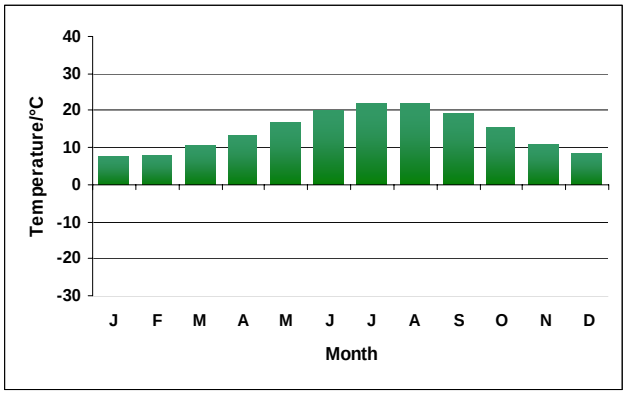
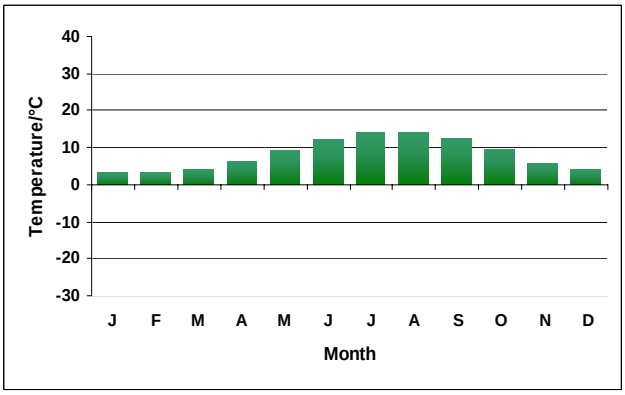
▪ Cold temperate - (maritime west coast)

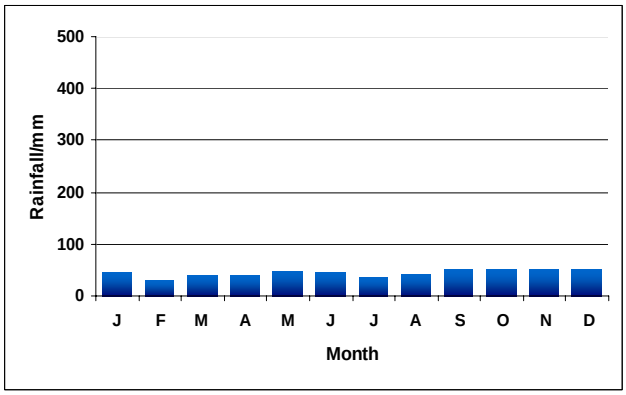
Climate averages for London, United Kingdom (51°28'N, 000°19'W)



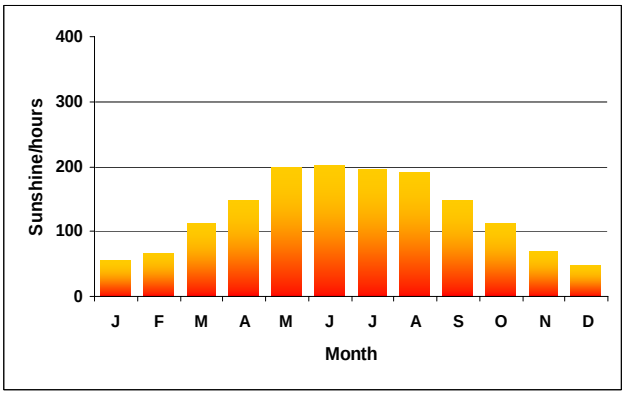
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages

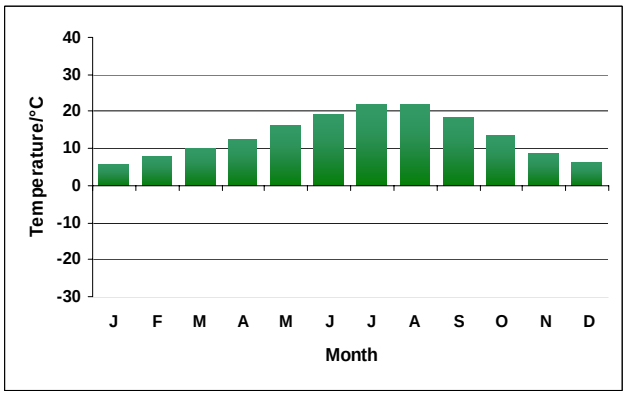


30-year monthly rainfall averages

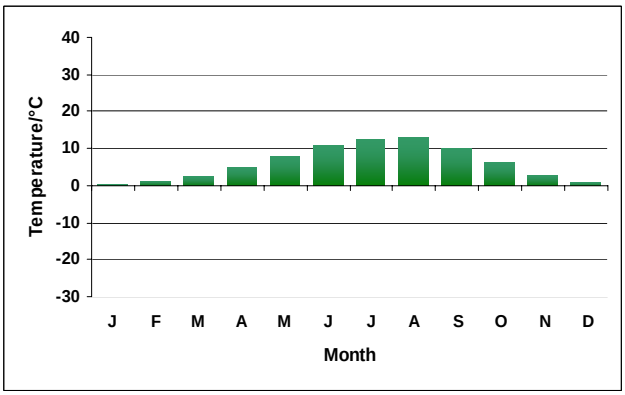


30-year monthly sunshine averages

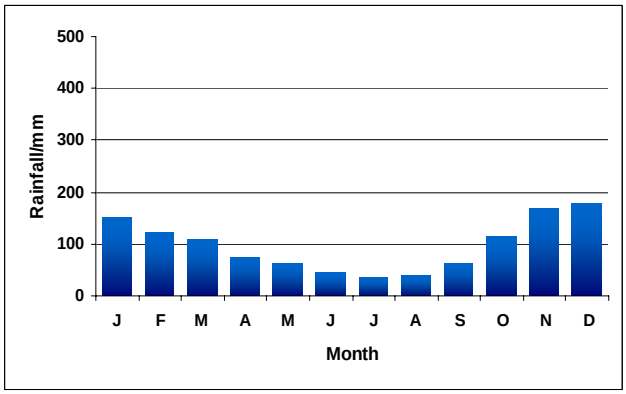
Climate averages for Vancouver, Canada (49°17'N, 123°05'W)



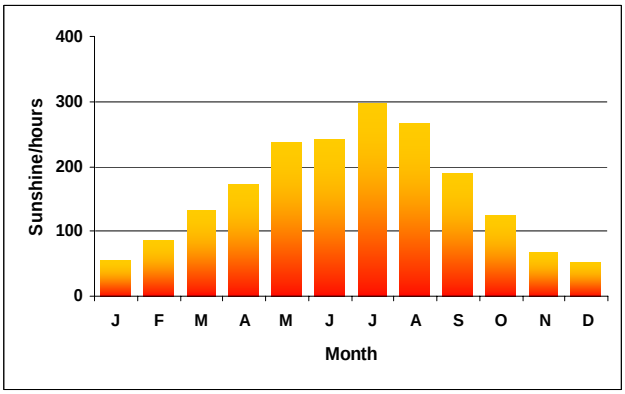
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages



30-year monthly rainfall averages



30-year monthly sunshine averages

Continental (humid continental and sub-Arctic)

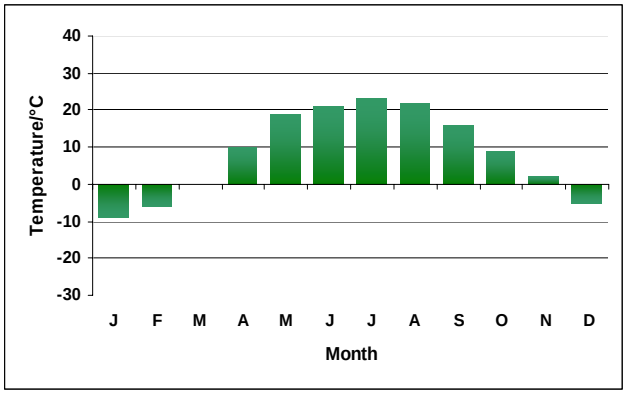
A type of climate, characteristic of the interior of large land masses of middle latitudes; the main distinguishing features are large annual and diurnal ranges of air temperature, with low rainfall a further characteristic feature. Continental climate zones can be split into two distinct types depending on temperature. These are Humid Continental and sub-Arctic.

- Humid continental is a climate found over large areas of land masses in the temperate regions of the mid-latitudes where there is a zone of conflict between polar and tropical air masses. The humid continental climate is marked by variable weather patterns and a large seasonal temperature variance.
- Sub-Arctic is a climate where the winters are very long and cold. Summers are short but can be surprisingly warm at times. Northern Canada and central Siberia are affected by this type of climate.

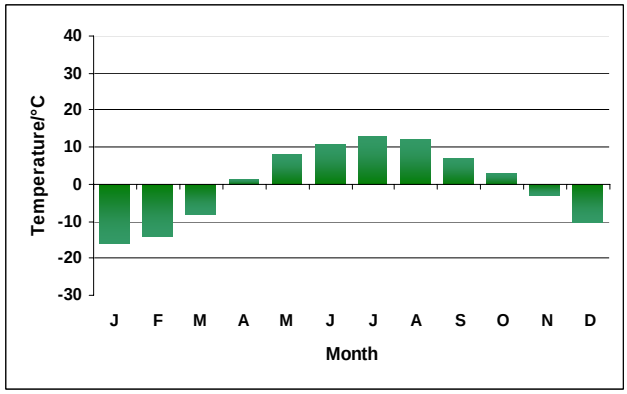
Another type of climate associated with large continental land masses is the **boreal** climate. This type of climate is characterised by a snowy winter and warm summer, with a large annual range of temperature, such as occurs over the European, Asian and American continents between about latitudes 40 and 60°N. The main feature of a boreal climate is the widespread distribution of coniferous forests.

- **Humid continental**

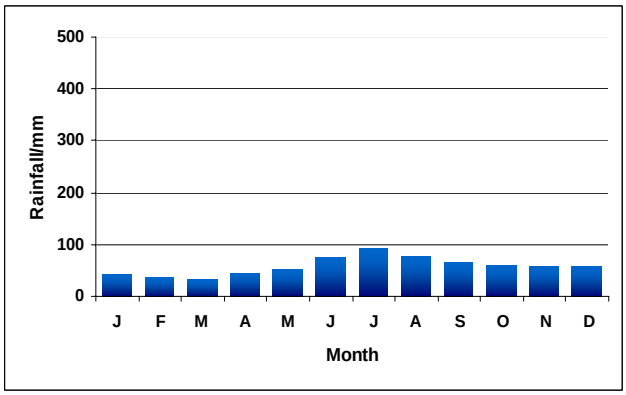
Climate averages for Moscow, Russia (55°45'N, 037°34'E)



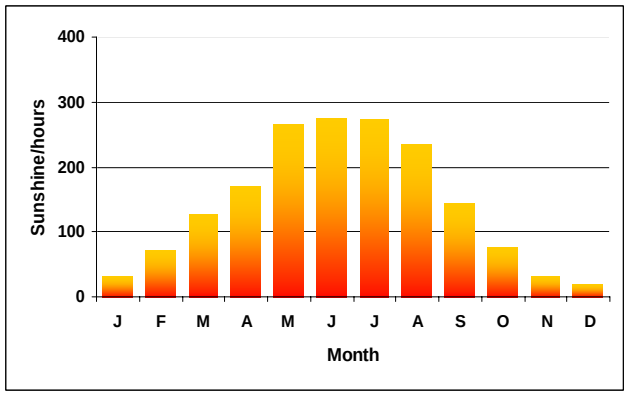
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages



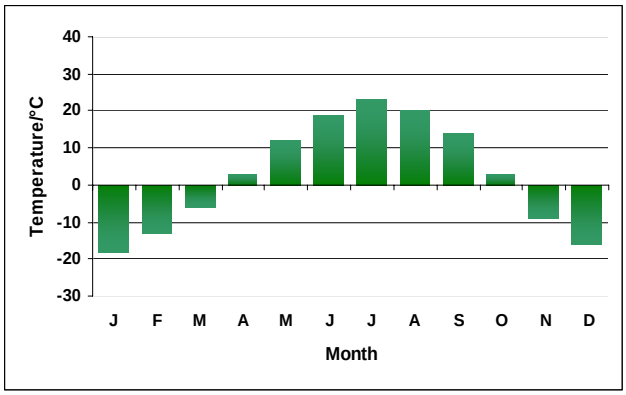
30-year monthly rainfall averages



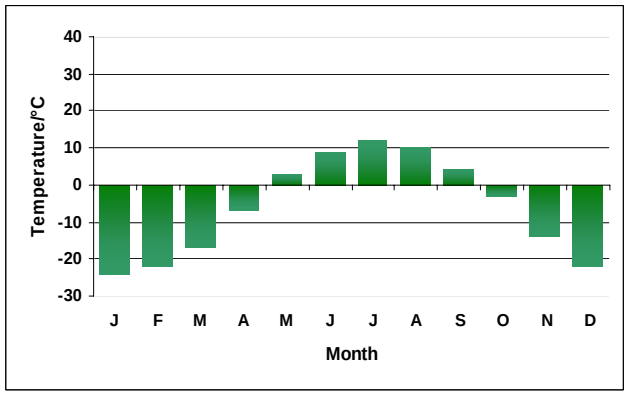
30-year monthly sunshine averages

- **Sub-Arctic**

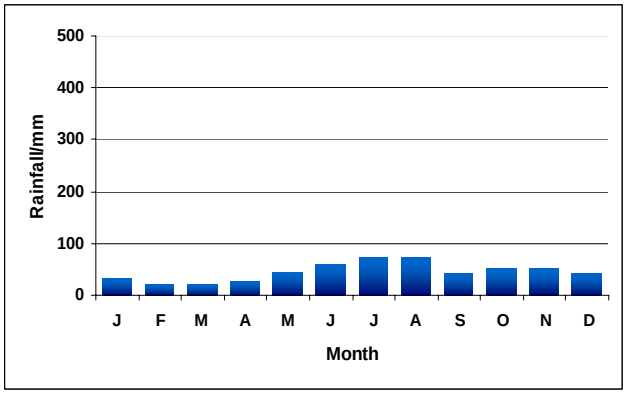
Climate averages for Tomsk, Russia (56°30'N, 084°58'E)



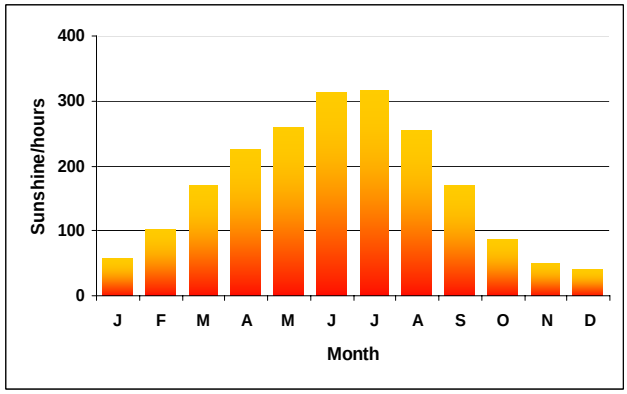
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages



30-year monthly rainfall averages



30-year monthly sunshine averages

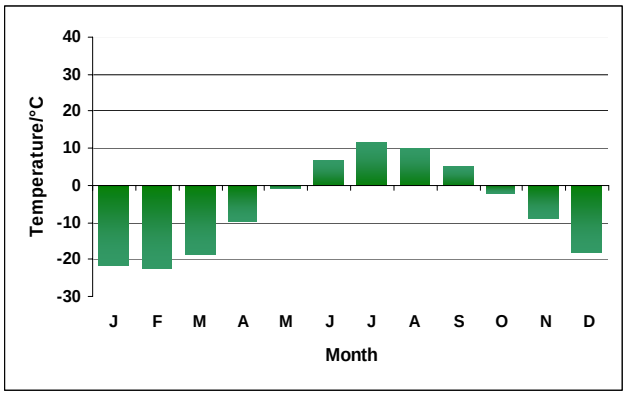
Polar (Arctic, ice cap and mountains)

Arctic and ice cap

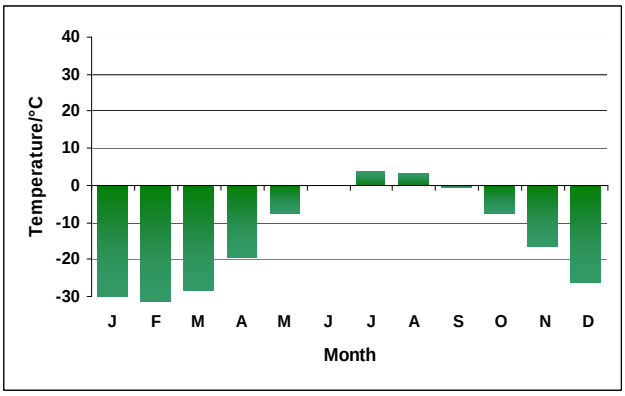
Figure 5. Polar Climate. Iceberg in the Scotia Sea, South Atlantic.

A type of climate which is prevalent in general, within the polar regions (polewards of 66°33' N and S). The polar climate is subdivided into Tundra climate (mean temperature of warmest month between 0 and 10°C), and Ice Cap climate (mean temperature of warmest month below 0°C). This type of climate can be found on Greenland and at the Antarctic.

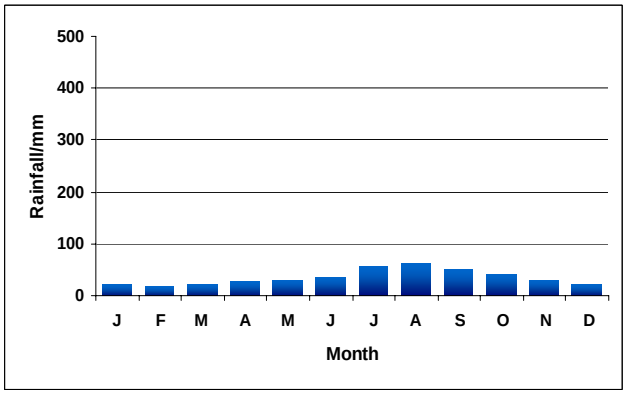
Climate averages for Frobisher Bay, Canada (63°27'N, 068°18'W)



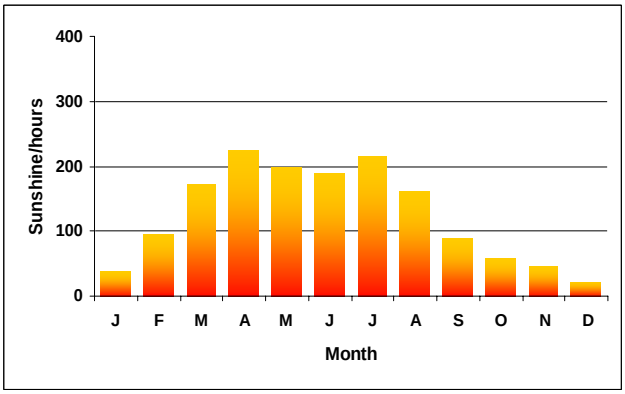
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages



30-year monthly rainfall averages



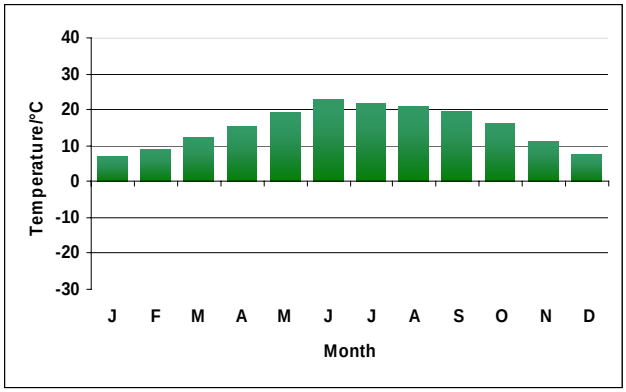
30-year monthly sunshine averages

Mountain

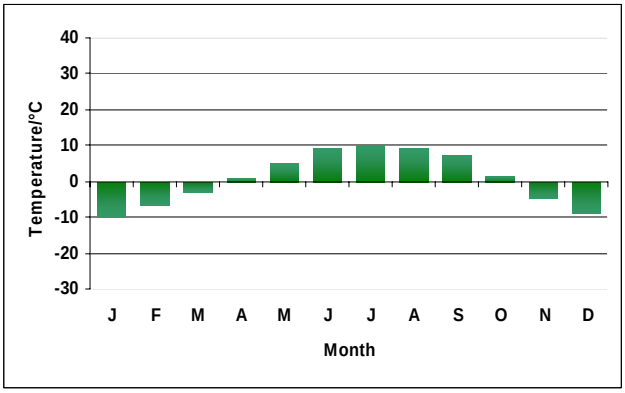
Figure 6. Mountain climate. Grandes Jorasses and Mer de Glace glacier, France.

Another type of polar climate is the mountain climate. It is something of a crude geographical term used for the kind of climate found in mountainous areas. These areas often have cold winters and mild summers. Due to their elevation, temperatures are lower than you would expect for their latitude and the main form of precipitation is snow, often accompanied by strong winds. These areas can be found in the high mountainous areas such as the Andes in South America, the Himalayas and the Tibetan Plateau.

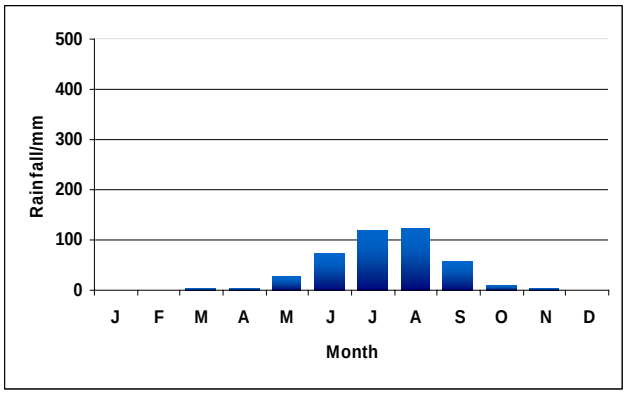
Climate averages for Lhasa, China (29°40'N, 091°07'E)



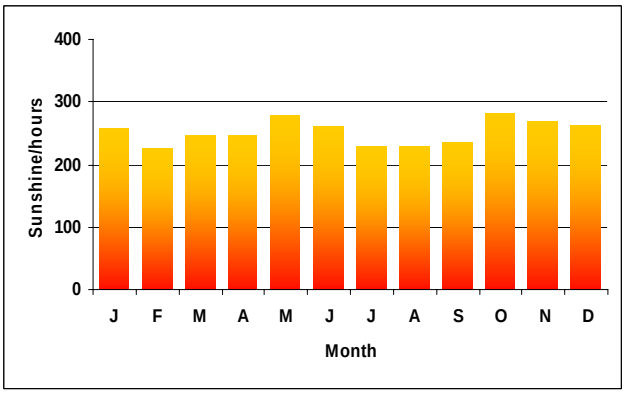
30-year monthly maximum temperature averages



30-year monthly minimum temperature averages



30-year monthly rainfall averages



30-year monthly sunshine averages

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